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Relationship between patellar resurfacing and postoperative anterior knee pain in total knee arthroplasty

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ABSTRACT

Aims: To retrospectively demonstrate the effect of patellar resurfacing (PR) on the clinical and functional outcomes of total knee arthroplasty (TKA).

Methods: The files of 257 patients who presented to our clinic between 2013 and 2022 and underwent TKA due to the diagnosis of grade IV gonarthrosis were screened retrospectively. Thirty-two patients were excluded due to not attending regular follow-up, receiving steroid treatment, or being morbidly obese. The sample consisted of 225 patients, of whom 123 underwent PR (Group A) and 102 did not undergo PR (Group B). The Sperner classification was used to evaluate the level of patellar arthrosis. The effect of PR on postoperative clinical and functional outcomes in patients undergoing TKA was investigated using the WOMAC knee functional scoring and Visual Analog Scale (VAS) for clinical and functional evaluation at six, 12, and 24 months postoperatively.

Results: The presence of anterior knee pain wasstatistically significantly lower in Group A than in Group B (p=0.0001). There was no statistically significant difference between the comorbidity distributions of the groups. The preoperative-to-postoperative changes in the mean VAS and WOMAC scores were statistically significantly higher in Group A compared to Group B (p=0.0001 for both).

Conclusion: The implementation of PR in TKA may vary depending on countries, clinics, and even surgeons. In the current study, PR was found to contribute positively to the clinical and functional outcomes of patients by preventing complications such as anterior knee pain that may develop due to patellar arthrosis in the postoperative period.

Keywords: Arthroplasty, knee replacement, patella, osteoarthrosis, complications

INTRODUCTION

Total knee arthroplasty (TKA) is a commonly employed surgical intervention for advanced osteoarthritis, yielding favorable outcomes.[1,2] One of the most important complications that negatively affects the success of this surgical procedure is the complaint of anterior knee pain (AKP) that develops postoperatively. AKP is defined as pain that occurs in and around the patellar region of the knee worsens with movement and exercise and negatively affects an individual's social life. It is one of the most common causes of permanent problems that develop after TKA.[2-4] The patella is subject to dynamic contact within the trochlear groove of the femur. While there is no contact in full extension, contact begins at the lower end of the patella and increases with the flexion of the knee. The patella-femoral joint is typically exposed to stresses reaching up to 20 times the individual's body weight.[5]

AKP and patellofemoral disorders after TKA are important reasons leading to the need for revision surgery.[5,6] Many functional and mechanical factors play a role in the etiology of AKP. The articulation between cartilage and metal is not considered physiological, and long-term exposure to high stresses is considered to cause erosion of cartilage. Factors such as improper placement of knee prosthesis implants, deficiencies in implant design, and muscle imbalance result in an increase in patellar chondrolysis in the postoperative period, leading to the development of AKP.[6-8] Surgeons who favor patellar resurfacing (PR) suggest that the incidence of AKP decreases after TKA, resulting in higher patient satisfaction and lower complication rates. However, there is still no consensus among orthopedic surgeons concerning the application of PR in TKA. The decision of PR is contingent upon the orthopedist's

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preference, as well as the mission and experience of the clinic where the surgeon works.[7-9] While some surgeons advocate for routine PR, others argue that PR must not be performed, while there is a third group of surgeons suggesting that PR can be undertaken in the presence of specific indications.[10]

This study aimed to reveal the effect of PR on postoperative clinical and functional outcomes in patients who underwent TKA and explore the conditions under which the use of patellar components was necessary.

METHODS

The study was carried out with the permission of Ethical Committe of Sakarya University (Date:31.01.2023, Decision No: E-71522473-050.01.04-216228-22). The files of 257 patients with grade IV gonarthrosis who presented to our clinic between 2013 and 2022 and underwent TKA were screened retrospectively. Thirty-two patients were excluded from the study due to not attending regular follow-up, developing prosthesis infections in the postoperative period, receiving steroid treatment, Simultaneous bilateral TKA applied or being morbidly obese. The sample consisted of 225 patients, of whom 123 underwent PR (Group A) and 102 did not undergo PR (Group B) during TKA. Patellar arthrosis levels were determined by evaluating preoperative tangential knee radiographs according to the Sperner classification (Figure 1).

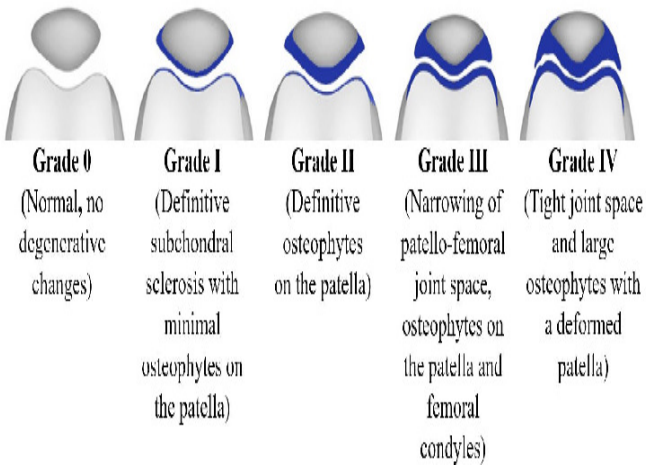
Grade 0
(Normal, no degenerative changes)
Grade I
(Definitive subchondral sclerosis with minimal osteophytes on the patella)
Grade II
(Definitive osteophytes on the patella)
Grade III
(Narrowing of patello-femoral joint space, osteophytes on the patella and femoral condyles)
Grade IV
(Tight joint space and large osteophytes with a deformed patella)

Figure 1. Sperner classification

All patients underwent surgery under epidural anesthesia and a tourniquet. The patients were prophylactically administered 3x1g of cephazolin, 1x6,000 IU of enoxaparin and analgesic treatment. The surgical procedure was performed using a midline long incision and median parapatellar deep exposure. The patella was rotated laterally by eversion. Extramedullary tibial alignment was performed with a plan to resect from the less affected lateral compartment. Intramedullary femoral alignment was undertaken using the balanced gap approach. For PR, an resection of approximately 5 mm was made, and patellar components made of three-peg and high-density polyethylene material were placed using cement. Cemented total knee prostheses of different brands (Wright, Stryker, Biomed, Concensus-Hayes Medical and Orthopedia) were used in all patients to protect the posterior cruciate ligament (Figure 2). After releasing the tourniquet, the layers were closed anatomically by inserting a suction drain to control bleeding. On the postoperative first day, the patients were mobilized, and passive exercises were started. The patients were allowed to bear full weight from day.[1] The effect of PR on the clinical and functional outcomes of TKA was investigated using the WOMAC knee functional score and the Visual Analog Scale (VAS) at six, 12, and 24 months postoperatively.

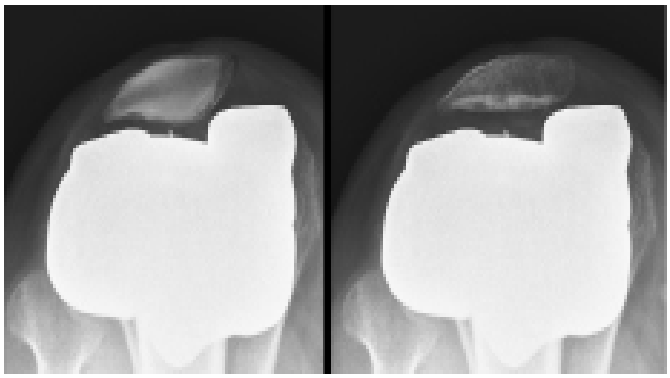

Figure 2. Patellar resurfacing preop –postop

Statistical Analysis

In this study, statistical analyses were performed using the Number Cruncher Statistical System (NCSS) 2007 Statistical Software (Utah, USA) package program. In the evaluation of the data, in addition to the use of descriptive statistics (mean and standard deviation), the distribution of the variables was examined with the Shapiro-Wilk normality test. The paired t-test was used in the preoperative and postoperative comparisons of normally distributed variables, the independent t-test was employed for the comparison of paired groups, and the chi-square test was conducted to compare qualitative data. The results were evaluated at the significance level of $p < 0.05$.

RESULTS

The mean age was 72.07±7.02 years in Group A and 72.49±7.27 years in Group B. All patients were female and had grade IV gonarthrosis. The average follow-up period was 34.53±5.14 months for all groups. During the postoperative follow-up, no wound healing problems were observed. Superficial skin infections occurred in three patients, who were treated with antibiotics. In the evaluations made according to the Sperner classification, the level of patellar arthrosis was classified as grade I-II in 143 patients and grade III-IV in 82. Among the patients with grade I-II arthrosis, PR was performed on 76 patients (53.15%), while it was not performed on the remaining 67 (46.85%). Of the patients with grade III-IV arthrosis, 47 (57.30%) underwent PYD, and 35 (42.70%) did not undergo PR. Postoperative AKP was observed in one (0.81%) of the 123 patients in Group A and 11 (10.78%) of the 102 patients in Group B. Since the clinical and functional complaints of the 11 patients in Group B with AKP increased, seven underwent revision surgery only with PR. In the postoperative follow-up

of these patients, AKP complaints started to resolve in the early period. No complications such as patellar fracture and aseptic loosening were observed after PR (Table 1).

Table 1. Statistical comparison of the operated groups

	Group A (n=123)		Group B (n=102)		p
Age (year)	72.07 ± 7.02		72.49 ± 7.27		0.657*
Grade I-II	76	61.79%	67	65.69%	
Sperner classification					
Grade III-IV	47	38.21%	35	34.31%	0.545+
Anterior knee pain	1	0.81%	11	10.78%	0.001+
Diabetes mellitus	20	16.26%	13	12.75%	0.458+
Hypertension	55	44.72%	52	50.98%	0.349+
Ischemic heart disease	7	5.69%	6	5.88%	0.951+
Vascular disease	3	2.44%	5	4.90%	0.321+
Renal disease	5	4.07%	4	3.92%	0.956+
Pulmonary disease	3	2.44%	2	1.96%	0.809+
Thyroid disease	4	3.25%	4	3.92%	0.787+
Operation time	49.19 ± 9.50		46.96 ± 8.36		0.066*
Preoperative VAS score	7.01 ± 0.9		7.05 ± 0.72		0.712*
Postoperative VAS score	2.47 ± 0.9		2.99 ± 1.1		0.0001*
p‡	0.0001		0.0001		
VAS score change %	64.74 ± 12.01		57.36 ± 15.8		0.0001*
Preoperative WOMAC score	58.66 ± 7.63		59.99 ± 6.32		0.161*
Postoperative WOMAC score	10.29 ± 4.61		12.46 ± 5.56		0.002*
p‡	0.0001		0.0001		
WOMAC score change %	82.97 ± 5.81		79.56 ± 8.01		0.0001*

*Independent-samples t-test, ‡Paired t-test+ chi-square test
Group A: patients who underwent patellar resurfacing, Group B: patients who did not undergo patellar resurfacing, VAS: Visual Analog Scale

The presence of AKP was found to be statistically significantly lower in Group A than in Group B (p=0.0001). No statistically significant difference was observed between the comorbidity distributions of Group A and Group B. There was also no statistically significant difference between the mean operation times of the groups (p=0.066). In both groups, the postoperative mean VAS scores were statistically significantly lower compared to their preoperative mean VAS scores (p=0.0001 for both) (Figure 3). Similarly, both groups had statistically significantly lower postoperative mean WOMAC scores compared to the preoperative period (p=0.0001 for both) (Figure 4).

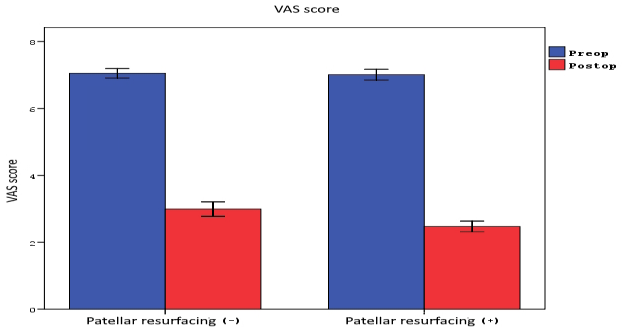

Figure 3: Mean VAS scores of the groups

According to the intergroup comparison, the mean postoperative WOMAC score of Group A was statistically significantly lower than that of Group B (p=0.002). Lastly, the mean preoperative-to-postoperative changes in the VAS and WOMAC scores were statistically significantly higher in Group A compared to Group B (p=0.0001 for both) (Figure 5).

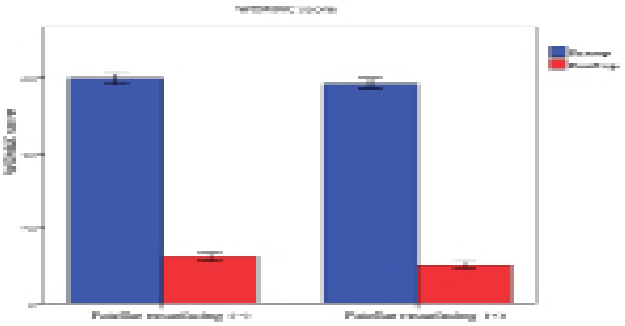

Figure 4. Mean WOMAC scores of the groups

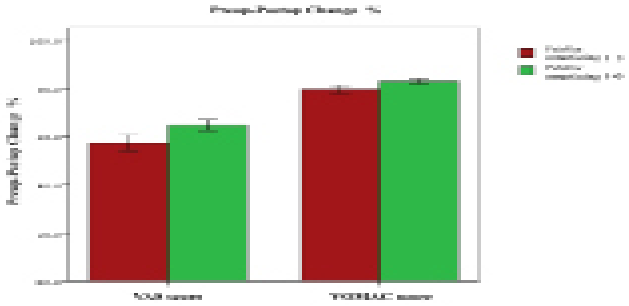

Figure 5. Preoperative-to-postoperative changes in VAS and WOMAC scores by group

DISCUSSION

TKA is a surgical procedure successfully applied in the current treatment of gonarthrosis and yields good clinical outcomes; however, certain complications, such as AKP, overshadow the success of the procedure and can be seen at rates reaching 8-10% in the postoperative period.[10] Although many factors that cause AKP have been documented after TKA, these complications are more common, especially in cases where PR is not applied.[11,12] Our study revealed a higher prevalence of AKP complaints following TKA in patients who did not undergo PR, starting in the postoperative sixth month. Due to the negative effect of AKP on the social and physical lives of patients, we consider that knee revision surgery for PR becomes inevitable. To prevent this situation, in which all other components may also be adversely affected by revision, we propose the routine application of PR during TKA, regardless of the level of patellar arthrosis, to achieve more positive clinical outcomes.

Although many studies suggest that there is no difference between TKA procedures with and without PR in terms of functional outcomes, in a study involving 124 patients (175 knees), Huang et al.[13] reported significantly higher rates of AKP in TKA procedures without PR at three-month and one-year follow-ups. They also noted a considerably lower incidence of patellar crepitus in cases where PR was performed. The

results obtained in our study align with the existing literature advocating for PR, demonstrating that PR minimizes postoperative AKP complaints. However, our study did not include data on the incidence of patellar crepitus. Matz et al.[14] suggested that in addition to PR, electro-cauterization of the terminal nerves around the patella could be beneficial in reducing AKP following TKA, based on the presence of numerous terminal nerves in this region. In our study, the area around the patella was denervated through cauterization prior to PR.

Peterson et al.[15] noted that the causes of AKP were multifactorial; therefore, the indication for PR should be determined very carefully, and the success rates varied between 50% and 60%. Sauer et al.[16] showed that PR not only provided better clinical outcomes but also reduced the possibility of revision surgery. Panni et al.[17] found that the risk of reoperation after PR was lower and that this may be effective in preventing AKP symptoms. Consistent with the literature, our study indicates that AKP complaints should not be attributed to a single cause, as multiple factors play a role in the etiology. We believe that PR reduces the risk of reoperation.

Fuchs et al.[18] determined that the patellar offset and the lateral patellar tilt decreased in patients who underwent PR, which may be related to AKP. However, the authors also noted that the effect of PYD on clinical and functional outcomes was very limited. Our study did not find evidence indicating a reduction in patellar offset and lateral patellar tilt in patients who underwent PR. Such complications are commonly observed in cases where proper patellar resection and accurate placement of the patellar component are not achieved. Fleaca et al.[19] emphasized the lack of a consensus on the use of PR during TKA and commented that AKP that developed in the post-TKA period was associated with more than one etiology; therefore, routine PR practice was not necessary. Evaluating patients who received zirconium ceramic implants without PR, Sato et al.[20] reported that the cartilage thickness in the patella decreased by half within five years compared to the preoperative period, and this negatively affected the clinical and functional outcomes of the patients. Parvizi et al.[21] observed no significant difference between the patients who underwent PR and those who did not undergo PR. Lastly, in a study aiming to reduce intra-patellar pressure with patelloplasty to minimize AKP, Ertürk et al.[22] concluded that this application did not have an advantage over other methods. We do not agree with the idea that reducing intra-patellar pressure through patelloplasty contributes to the alleviation of AKP complaints. Our study did not obtain any data supporting this claim.

In primary total knee arthroplasty, there are three strategies for patellar management. The first strategy is to always resurface the patella, the second is to never resurface it, and the third is to resurface the patella based on specific indications. However, different data supporting each of these strategies have been reported in the literature; therefore, it is evident that there is no consensus in the literature concerning the application of PR in TKA. Different ideas have been proposed depending on countries, clinics, and even surgeons.

Limitations

This study has certain limitations. First, the study was designed retrospectively, meaning that the patients were not randomized before surgery. Second, it is difficult to accurately evaluate the level of patellar arthrosis through observation using direct radiographs. Lastly, the absence of male patients in the patient groups had a negative impact on the evaluation of the data, hindering a gender-related comparison.

CONCLUSION

In this study, significant differences were found between the patients who underwent PR and those who did not undergo PR during TKA in terms of AKP complaints. TKA is a major surgical procedure, and we consider that PR will have a positive impact on the clinical and functional outcomes of TKA by preventing AKP complaints, potentially prophylactically, in the postoperative period. We consider that this study will shed light on future research and that there is a need for further studies involving more patients and evaluating more parameters.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Ethical Committe of Sakarya University (Date:31.01.2023, Decision No: E-71522473-050.01.04-216228-22).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper and that they have approved the final version.

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